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THE JOURNAL OF PHILOSOPHY

PSYCHOLOGY AND SCIENTIFIC METHODS

THE LOGIC OF ANTITHESIS

THE antithesis, such as life and death, finite and infinite, reality and unreality, one and many, plenum and vacuum, internal and external, cold and hot, pleasure and pain, or good and evil, is a peculiarly interesting form of negation. In many cases of antithesis, it is true, both the terms are positive at least in form. In meaning, however, each is a negative of the other. The logic of antithesis, then, must afford an interesting chapter in the general logic of negation and, if antithesis may be defined as extreme difference, then also in the logic of difference.

The subject of antithesis is, of course, a very old one. Also it has received many treatments, as might be expected. Still, whatever may have been said or done in the past, a new statement or a rewording always has some chance of proving worth while. Accordingly, without making claim to a serviceable originality and without even feeling any certainty of such originality, I would venture in the following six paragraphs to indicate some principles of all antithesis that seem very important to me, making thus what the scientists call, and what may be, only a preliminary report. The principles are these:

1. *Mutual Reproduction*.—The terms of any antithesis can not but be relative. This is no less true of finite and infinite, real and unreal, plenum and vacuum, than it is of cold and hot or good and evil. Indeed in the case of finite and infinite, if not in those other cases, the relativity is a very old story. But, each term being relative, neither can be without the character of the other. The relative is always the mixed. Wherefore the terms of an antithesis reproduce each other; and, emphatically, this is not to say that each implies the other only by contrast. What it says is, again, that each has in its own right or in its own nature the character of the other. In fact the reproduction must be seen as not only of each term by the other, but also in its entirety as of the antithesis itself by each term. Each term has that within itself whereby, as if internally, it harbors

the very antithesis as a whole of which, externally, it is only one member.

2. *Duplicity of Meaning*.—Since the terms of any antithesis are thus reproductive, each reproducing the other and so harboring within itself both itself and its opposite, they must always have double meanings. The antithesis and the reproduction make this duplicity absolutely necessary, for where each is on both sides each must get, besides its first meaning, the one-sided meaning, a second meaning that is adequate to the both-sidedness. The opposition of life and death affords a simple but not at all peculiar or exceptional illustration. Here the distinction is a reproductive and so transposable one, but only if the terms after transposition have new meanings. Briefly to indicate the new meanings, there are the life that is simply before death or is the mere absence of death and the life that is superior to death; there are, on the other hand, the death that is only the cessation of life and the death—how shall I express myself, not being either theologian or biologist?—that belongs even to life itself, not merely to its cessation, if the life be not superior to death. And, as of life and death, so of knowledge and ignorance, rest and motion, reality and unreality, external and internal, and so on. Also, in general, the duplicity, now so evident, plainly must always have this form: a local, narrow, one-sided meaning, to begin with, and then a meaning big and deep enough to take both sides up into itself. Wherefore we may conclude that involved in any antithesis there is more than just the opposition of two terms or even than the possible transposition of those terms. There is also, as the warp in the woof, the important tension of part and whole, the peculiar opposition of the particular and the general; and, if this, then, as a result at once of the opposition, the transposition, and the insistent wholeness, in the very duplicity there is involved a difference of quality. A whole is not merely more than any of its parts; it is different.

3. *Identity of the Opposites*.—What this identity means, not to say also what it does not mean, is fairly clear from what has been said. With the reproduction and the double meaning it is easy to see why, and in particular how, opposites can be declared identical; why and how paradoxes so often go with insight. The identity is indeed very far from being a superficial one; superficially there appears anything but identity; and one who can never see or think beneath the surface will find in paradoxes only verbal gymnastics or formally logical subtleties; but opposites are identical, being so, again, through their mutual reproduction and, above all, through the two meanings of each, one meaning being indeed always exclusive, but the other free and hospitable. And because of the two meanings, the

identity of opposites must always indicate a becoming, for that identity necessarily connects the two meanings, marking a change in the case of each term from one meaning to the other. No wonder that Heraclitus has always been a hard man to understand with his becoming, his paradoxes, and his hidden but very certain double meanings for all his terms! As for the becoming, too, of course it can not refer to any mere flat reconciliation of the antithesis, but also it can not refer even to a mere inversion and, except for quantitative changes, literal repetition of the antithesis; on the contrary, it must involve, in the first place, instead of reconciliation, a great sharpening of the antithesis and, in the second place, instead of repeating the antithesis merely in larger terms or on a larger scale, it must take the antithesis into a new region, new not for size alone, but for the difference of quality which has been pointed out. In short, the becoming which the identity of opposites necessarily indicates is in general nothing less than the persistence of all the antitheses of life or of reality, *but always with a real change of meaning or quality for the antithetical terms*. In any antithesis, let me say, risking perhaps useless repetition, each term has two meanings, one small and obvious, the other big and hidden, and the big and hidden meaning, because it comprehends the things that are opposed, is more than just big; it is different; so that the identity of opposites means only a becoming that brings generalization, qualitative variation, and renewed opposition. *Were there becoming on any other plan, could reality change and yet be also conserved?*

4. *Serial Mediation*.—Doubtless to ordinary thought an antithesis signifies two terms that are in what I will call a single, ungraded, cataclysmic difference, meaning of course a difference of complete exclusion, a difference under which neither term has any contacts, or any dealings, with the other. Metaphysical dualism as representing the antithesis of the material and the spiritual or immaterial is doubtless the most notable instance of such thinking. The principles of reproduction, however, of duplicity, and of identity show conclusively how inadequate any such cataclysmic difference must be to any real antithesis. In dualism or in any other antithesis the opposed terms can no more truly have a cataclysmic difference than in the familiar case of day and night. Those principles call irrevocably for mediation through an infinite series. They make the antithesis seem only such a series short-circuited. Has not each term in its own character, in its own meanings, a "one-to-one" or "part-for-part" correspondence with the antithesis, let me say the differential antithesis, as a whole, to which it belongs as a part, and can anything but an infinite series satisfy the reproductiveness which such a correspondence must always imply? Again, where the oppo-

sites are identical through their duplicity, can anything but the infinitely serial functional relation of the two things be adequate to their peculiar entanglement? The functional series, it is true, outwardly shows merely the orderly and parallel, parallel and orderly movement of two terms, say, in the typical case, of one term from zero to infinity, of the other from infinity to zero; but the logic of any such function is larger or deeper than the mere outward quantitative form is likely to suggest. Thus, besides the quantitative form, there is the infinity, with its peculiar innuendo of qualitative difference, and there are also, not less peculiar or significant in their innuendo, the *inverse* relation of the serial approximations to zero or to infinity of the different terms, and the persistent differential, constituting a controlling principle or law, by which the series proceeds. So, emphatically, the terms of an antithesis are not in a cataclysmic difference. Their difference is serial; they have a serial mediation; and, if one remember both warp and woof, the mediation is not more of the opposite terms than of the different meanings. Moreover, as to this mediation, in a sense which I hope to make clear and which at the same time will prevent the too easy misunderstanding of the word itself, instead of reducing the difference the serial mediation intensifies it, making it truly extreme. Thus, just because the difference is so graded, it must constitute or realize what might be called an unchecked and cumulative differentiation, and must therefore, as was said, make the difference or the antithesis extreme as no single cataclysmic instance could possibly do. Think of the immeasurable excess of the sum of all possible cases over just one last case of any difference. Here, once more, the familiar but wholly typical antithesis of life and death may be used in illustration. Let death be cataclysmic, and its opposition to life is really of comparatively little import; but let there be a serial difference or a serial mediation between them, let there be such a thing as either dying or living, let neither ever be unmixed, that is, unaccompanied at any time by the other, and the opposition or antithesis is supreme, made so—no other word could be more expressive or more pertinent—by the very immanence of each term in the other. To be always dying even while one lives is no ordinary death. To be always living even while one dies is no ordinary life. And, as of life and death, so, *mutatis mutandis*, of good and evil, motion and rest, plenum and vacuum. The logic that lies back of the series would thus seem to suggest that in some way true opposites must be not merely reproductive, nor yet only double in meaning and so identical, but also, as if to make the intimacy as close as possible, mutually immanent. The serial mediation, to say the least, shows them immanent in the sense of being, not indeed structurally, but functionally identical.

5. *Difference at Once in Kind and Degree.*—Here little can be added to what has been said already. Frequently, however, difference in degree is treated as no real difference, gradation and continuity being falsely taken as synonymous, and it is, accordingly, well in this separate paragraph to give emphasis to what is certainly the consistent and logical view, namely, that gradation must always mean real difference, the realest sort of difference. Gradation is always some difference functionally expressed, and this, involving two terms, can hardly signify continuity. A continuous series, where the series is a function—and any other series seems meaningless—is a self-contradiction. The functional series, too, may have unity, but not of the sort that continuity usually denotes. Where there is difference in degree, there is supreme difference in kind, although at the same time there is the real unity of the functional relation.

But such confident association of difference in kind with difference in degree, and the previous suggestion of immanence as expressive of the relation between things quite antithetical, or of serial mediation as sharpening an antithesis even while it connects the things opposed, certainly do call for explanation along other lines than those which have so far been followed. However cogent and imperative the logic so far presented here may have been, there is still a sense of something not yet said. All that has been said may be quite true of difference or of antithesis, but the question remains: What else is true? What, if anything, will make the foregoing as intelligible as it seems logical? In the next paragraph at least a partial answer to this question will, I think, be found.

6. *Dimensional Difference.*—The fact that difference, especially as expressed in antitheses, may be dimensional, may not be the key, but I believe it to be a very important notch in the key that will unlock the remaining mysteries of antithesis or of difference in general. Indeed, as seems to me, what has been said so far in this paper, especially in the last two numbered paragraphs, virtually has been an indication of dimensional character or rather, more exactly, of the peculiar relation that one dimension bears to another. In other words, any antithesis, having two terms, would seem to be also two-dimensional. Slightly to reword what has been said, the terms of any antithesis imply qualitative difference; being “identical” or “immanent,” although different, they are necessarily mutually implicative or general to each other; and a functional series expresses at once their unity and their difference. Just these things, however, constitute what seem to me to be the essential conditions of a two-dimensional region. Thus, to take the simplest and most direct illustration available, length and breadth are certainly internal implications of each other, and their difference very plainly involves some-

thing besides a quantitative distinction. All dimensional differences, not merely that of length and breadth, are qualitative. Of course as differences of direction they are quantitatively measurable; so are the differences of distance in either of their particular directions; but the former differences distinctly are not of the same sort or kind as the latter. Also the quantitative variations within any given direction or dimension may be functionally related with those of any other direction or dimension, or quantitative differences of direction or dimension, that is, angular differences, may be functionally related with the differences within any direction or dimension; but in all cases a functional relation involves more than mere quantitative difference. In a word, therefore, the spatial dimensions, length and breadth, or, let me say, the spatial dimensions in general, whatever their names or whatever their number, being characteristically the terms of functions, are qualitatively rather than quantitatively different; and space itself as dimensional, whether two-dimensional or n -dimensional, is no mere mass or quantum, but is a proper medium, or, if you please, a proper container, of things at once quantitatively variant, qualitatively different, and functionally related. By the kind ordering of providence or by the pleasant accidents of nature, the multi-dimensional character of space seems eminently suited, I can not quite say, to a pluralistic universe, but to a universe that is big with more than just one sort of thing, to a universe that is qualitatively plural.¹ It is suited, too, to a universe whose differ-

¹ This is hardly the place, nor am I competent, for a critical discussion of space in general or of the Euclidean space in particular. The above references to space and its dimensions have been rather boldly made for purposes of needed illustration of the dimensional difference which I seem to see in any antithesis. The terms of any antithesis are qualitatively different and yet functionally related; so are the dimensions of space; and doubtless with such an analogy between the two I should be content. In this note, however, I have to go a little farther with my layman's account of dimensional space. Thus, it has seemed to me as if the Euclidean space with its three rectangular dimensions might be spoken of as the logical whole in extension. Thus, no science being so hospitable to hypothesis as mathematics, I would hypothesize that the right angle is the spatial representative of any distinct difference in kind; and on this hypothesis I would venture to say that any single difference is two-dimensional, but that a multiplicity of differences, that is, of different differences, in short a general plurality, must be three-dimensional. Logically, it should be remembered, the third dimension is not just one dimension among others; it is third, and is, accordingly, a dimensional variant or a differential compounding of the region already defined by the first and second. Moreover, add a fourth dimension and, at least on the rectangular hypothesis, the resulting region, if it may still be so called, will spring from an involution or an intensification of the extensive three-dimensional region already defined. Beyond the third dimension, the dimensional variation or increases can be seen only as giving matter or content to Euclid's merely geometrical solidity. Indeed, if now I be not too fantastic, it even seems

ences are antithetical, for the antithetical difference characteristically is dimensional, being, to repeat the story very concisely, qualitative, implicative, and functional.

That the second dimension is an implication of the first may not yet be as clear as it should be, and yet mathematically simple addition, which is one-dimensional, implies multiplication, which is two-dimensional, or the defined line implies the plane, the given length or side the area. Moreover, the implication here is truly inherent. Thus, addition and limitation, as in the case of the given length, although formally representing number or length only as mass, very plainly do imply the character of the ratio; and this distinction between mass and ratio is a distinction involving just the difference between one and two or, even more generally, between n and $n + 1$ dimensions. Ratio, too, is always functional, not simply quantitative. But, more than this, the implications of any dimensional field, be the number of dimensions one or n , may be said to be made explicit whenever any operation within the given field is projected to infinity. Such projection, by virtually abstracting the given field, or, say, by reducing this to "zero," liberates the principle of the operation from its formal and always somewhat one-sided setting, and so exposes or at last reveals, what at least those who have eyes may see, the hitherto hidden other dimension of the operation. There always is another dimension when there is an operation. Thus, at infinity such a series as the following: $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8} \dots 0$, or, geometrically, $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$, has for its last term the operation of halving without anything left to halve, and this is certainly equivalent to a separation, a splendid isolation, of ratio from the given mass, and so to what is at least a very strong innuendo for another dimension. Indeed, remembering that infinity is meaningless without an "operation" of some kind, I find myself constrained to translate any n -dimensional region at infinity into an $n + 1$ dimensional region, and accordingly to conclude—perhaps a digression in this paper—that as applied to space infinity means dimensional rather than merely quantitative variation. Quantitatively any space may be as large as you please, but no space, no line, no plane, no solid, is infinite, just

to me as if any additional dimension, be it second or fourth or n th, might be said in some sense to express something that is implicit to the dimensional region just below, perhaps as multiplication is implicit to addition or area to definite length, and so to make the difference in general between n -dimensions and $n + 1$ -dimensions quite parallel to that between form and content. Only, again on the rectangular hypothesis, at the fourth dimension the material significance of the new dimension is forced upon the attention, as in neither of the earlier cases, for at this dimension the dimensional field is plainly seen to be necessarily turned into itself. (Cf. article in *Mind*, April, 1911, "Dualism, Parallelism, and Infinitism," especially pp. 221-5.)

quantitatively infinite. Still, the mere infinity of space aside, what all this means here is simply that spacially one dimension inherently implies another, and that infinity is always an innuendo for that other dimension, and consequently that with good reason the difference expressed in any antithesis may be spoken of as dimensional. Recall that the terms of the antithesis, like spacial dimensions, not only are qualitative, implicative, and functional, but also imply the infinite series.

7. *Parallelism in All Difference.*—Any single case of real difference is dual and is in so far a case of antithesis. The terms of an antithesis, however, logically require serial mediation, as has been explained here, and the serial variation, so determined, is analyzable into an “orderly and parallel, parallel and orderly, movement of the terms.” In other words, incidentally to the mediation, each term shows variants that correspond specifically in every instance to the variations in the other, so that all the important conditions of what—at least when the question is of mind and matter—is commonly known as parallelism seem to be fulfilled in any difference or antithesis. But the parallelism in all antithetical difference is no mere “occasionalism.” The relation is very far from being external to its terms. Indeed this has been indicated quite definitely, although perhaps not as directly as it should be, in a foregoing paragraph. Thus, more directly and in more detail, given the condition of parallelism between two terms that are antithetical, and given as valid the conclusion, reached here, that antithetical terms are reproductive, double, identical, and serially mediated, then in the parallelism, which is incident to the serial mediation, there can be detected a process, the very becoming to which reference has been made already, having the following important aspects:

(a) Identification, but in the sense that each term gradually loses itself in the other or takes the other into itself, in either way of putting it, the two terms becoming indifferent or identical *in respect to their first meanings*.

(b) Transformation, or qualitative change, in the sense that with the parallelism, or at least with the becoming which this must imply or be a sort of cross-section of, the terms necessarily pass from their first to their second meanings, from their small meanings before identification to their large and qualitatively new meanings after identification.

(c) Persistence or renewal of the antithesis; persistence in the sense that, because the identification and the transformation are coincident processes, the opposition is always rising and assertive, even while it is passing, rising as to the new meanings, passing as to the old, or renewal in the sense merely of such repetition as the

change of meaning must require. Thus who sees only the parallelism, external and occasionalistic, sees a very small part of what is going on.

And here I must bring this possibly merely preliminary report to a close. Only, as I do so, I can not refrain from suggesting some of the important problems that may find interesting solutions from the treatment of antithesis given in this paper. The problems I would mention are three, and from widely removed quarters. Thus: (1) What is the effect on psychophysical parallelism of the fact that the "parallel" terms are always antithetical? (2) If the two schools, either of ethics or of theory of knowledge, the intuitional or idealistic and the utilitarian or empirical, may be said to base morality, or valid knowledge, on the internal and the external respectively, what effect on the interpretation of the history of ethics or theory of knowledge must result from the present logic of antithesis? And (3), What are the consequences to a doctrine of motion of the conclusion, here reached, that quantitatively space is always finite, its infinity standing, not for infinite quantity, but for dimensional or qualitative variation? Is an infinite velocity, for example, to be entertained even in thought?

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CONTINENTAL CRITICS OF PRAGMATISM

II. ITALIAN CRITICS

IN pointing out the deficiencies of the current pragmatism from the point of view of theology the French criticism has reached its highest point. We may therefore turn to the Italian attitude towards this subject. Bourdeau has already given a somewhat unfavorable account of the southern variations of the system. According to him, pragmatism, which began as an Anglo-Saxon reaction against intellectualism and rationalism, has among the subtler Latins been transformed into a Machiavellian opportunism, an abandonment of the world to our particular fancies, in fact to whatever volitions eventuate in success.²² Reference is here obviously made to James's protégé, the sky-rocket Papini.²³ His individualism is further exemplified in the case of Prezzolini, one of the founders of the obsolescent journal *Il Leonardo*. The latter's modification of pragmatism is then designated a pure sophistication. When James,

²² "Pragmatisme et modernisme," pp. 83, 84.

²³ Cf. my review of his "Il Tragico Quotidiano," *The Nation*, November, 1907.